Lithium-ion Energy Storage at Very Low Temperatures, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Li-ion batteries with specific energy >180 Wh/kg, calendar life (>15years), and a wide operating temperature range (-60

o

C to 60

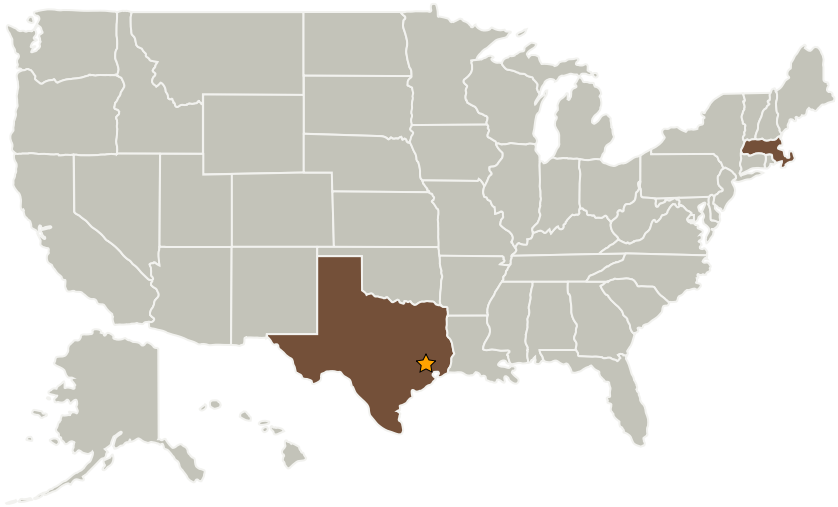
o

C) are crucial for the deployment of exploration vehicles such as rovers, landers, and penetraters as well as for low temperature burst power communication. The sub-ambient conductivity and liquid range of present rechargeable Li-ion battery electrolytes severely limit low temperature use. Co-solvents freezing as low as -132oC and Li salts with highly delocalized anions, enabling high degree of ionic dissociation in low dielectric environments provide us with a unique opportunity to develop non aqueous electrolytes for the low temperature with ionic conductivities well above 10-4 Scm-1. Our aim is to use these novel electrolytes as a direct substitute for the present electrolytes without affecting Li-ion battery performance or life during normal operation and access as least half the rated capacity at -60

o

C and 1/2C discharge rate. Working in collaboration with a leading developer of Li-ion batteries in Phase I, our low temperature electrolyte formulations will be evaluated in Li test cells containing anodes and cathodes used in commercial scale battery manufacture. In Phase II, electrolyte composition will be further optimized and prototype batteries will be fabricated and tested for performance.

Primary U.S. Work Locations and Key Partners



Lithium-ion Energy Storage at Very Low Temperatures, Phase I

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

Lithium-ion Energy Storage at Very Low Temperatures, Phase I

Completed Technology Project (2006 - 2006)

Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
EIC Laboratories, Inc.	Supporting Organization	Industry	Norwood, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.1 Electrochemical: Batteries